Tomohide (JP'383) discloses, at best, an aluminum nitride substrate which may be suitable for use in a wiring board or the like (see [0001]) and is produced by applying a metallized layer on the surface of an insulating substrate made of a sintered aluminum nitride (Abstract). Tomohide (JP'383) also fails to disclose or suggest a substrate having a heating element. Therefore, Tomohide (JP'383) fails to disclose or suggest that its substrate may be used for a ceramic heater. Further, Tomohide (JP'383) fails to disclose or suggest whether the fracture type of its substrate is an intragranular fracture or an intergranular fracture. Even if the fracture type of the substrate is an intragranular fracture, Tomohide (JP'383) does not disclose or suggest a ceramic heater. Accordingly, no motivation can be provided to one reading Tomohide (JP'383) to obtain the high fracture strength at a high temperature and prevention of generation of free particles.

Susumu (JP'955) discloses, at best, a production method of an aluminum nitride sintered compact where an oxygen-containing and nonfluorine base rare earth metal compound is used as sintering aid (Abstract). The sintered compact according to Susumu (JP'955) is used for an insulating substrate of semiconductor device (see [0002]). Susumu (JP'955) fails to disclose or suggest that the sintered compact has a heating element. Thus, there is no disclosure found, nor motivation provided therein, to use it for a ceramic heater. Accordingly, there is no motivation to one reading Susumu (JP'955)that the generation of free particles is prevented if the compact disclosed therein may be used for a heater.

As mentioned above, neither Susumu (JP'955) nor Tomohide (JP'383) describes a sintered ceramic substrate having a heating element. Therefore, both of them can not be used for a ceramic heater or an electrostatic chuck. Further, there is no motivation one of ordinary skill in the art would have to combine Susumu (JP'955) and Tomohide (JP'383) to provide a ceramic heater or an electrostatic chuck.

Tomohide (JP'431) fails to disclose or suggest whether the fracture type of the substrate. More specifically, one reading Tomohide (JP'431) could not possible know if the fracture is intragranular fracture or intergranular fracture therein.

Kenji (JP'603) discloses, at best, an electrostatic chuck having an electrode for applying voltage on the surface of a substrate made of an insulating material and a ceramic resistor layer formed thereon. Further, a heater may be embedded inside the substrate (see Figure 1).

The Office indicates that the ceramic resistor layer is an aluminum nitride sintered body. However, the Office is clearly mistaken. In fact, the ceramic layer disclosed by Kenji (JP'603) is an aluminum nitride layer formed by PVD or CVD (see [0022]). In PVD, atoms are forced to deposit on the surface to form a film, thus the film is not crystalline, but amorphous. In CVD, a homogeneous film is formed by developing a crystal from the center nucleus with the use of starting material gas. A ceramic layer obtained by either method is clearly different in its constitution from that of a sintered ceramic body.

In the semiconductor producing device according to Kenji (JP'603), the ceramic resistor layer is formed at least on a surface where a silicon wafer is placed, or on the whole surface being exposed (see [0013] and Fig.1). Further, since coming-off of ceramic particles is a problem specific to a substrate obtained by sintering a starting material powder, the ceramic resistor layer according to Kenji (JP'603) does not cause such a problem. Thus, Kenji (JP'603) fails to disclose or suggest a ceramic substrate having an intragranular fracture type, thereby failing to suppress the occurrence of coming-off ceramic particles and prevent contamination of the object to be heated.

In direct contrast to all of the above-mentioned references, a first aspect of the present invention relates to a ceramic heater containing a sintered ceramic substrate having a heating element inside or on the surface thereof. The claimed ceramic substrate has been sintered

such that a sectional view of fracture thereof exhibits an intragranular fracture (see Claim 17 above). Intragranular fracture is a phenomenon wherein fracture occurs not at the grain boundary, but inside the crystal grain. In an intragranular fracture type ceramic, the fracture strength comes from the specific strength of the crystal. Thus, the fracture strength of the ceramic is kept high. Moreover, during intragranular fracture, crystal particles do not easily come off alone, thus generation of free particles is suppressed.

The ceramic substrate according to the present invention may be a sintered body in which the intragranular fracture occurs at the time of fracture. The claimed substrate may have a high fracture strength at a high temperature, therefore, contamination of an object to be heated by free particles that come off of the ceramic substrate may be avoided. The claimed sintered ceramic substrate may not be composed of a single crystal, but composed of a polycrystal. Thus, where the conventional substrate usually tends to contaminate an object to be heated by free particles that come off from the ceramic substrate, the present invention resolves such a problem.

The above remarks and arguments are further clarified by the comparison of Examples and Comparative examples in the present specification. Examples 8 to 12 represent substrates having intragranular fracture, and Comparative Examples 1 to 5 represent substrates having intergranular fracture. The number of free particles in Examples 8 to 12 is $0.5/cm^2$, while it the number of free particles is from 2 to $10/cm^2$ in Comparative Examples 1 to 5. Thus, intragranular fracture in the claimed invention provides a four-fold to twenty-fold decrease in the number of free particles. Clearly, such effects are neither disclosed and/or suggested by the above cited references.

In light of the above, the claimed invention is neither disclosed, nor suggested by the above references or any combination thereof. Accordingly, withdrawal of these grounds of rejection is respectfully requested.

Applicants respectfully submit that the present application is now in condition for allowance. Favorable reconsideration is respectfully requested. Should anything further be required to place this application in condition for allowance, the Examiner is requested to contact Applicants' Attorney by telephone.

Respectfully submitted,

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IN THE CLAIMS

--Claims 1-16 are cancelled.--

--Claims 17-63 are added.--